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ABSTRACT

One of the most important capacities which children employ when learning language is the capacity to generalize. A child who hears an utterance of a verbal expression while perceiving a particular object (or action, aspect, etc.) becomes normally able to apply the expression not only to this object but also to all those objects which, for him, are similar to the original one. These objects constitute his generalization class relative to the original object. Two kinds of generalization classes can be distinguished: species-determined, or innate, and species-indetermined, or acquired. Whereas children are born with the capacity to generalize in accordance with the former classes, they must undergo certain kinds of experiences in order to learn to generalize according to the latter classes. In the paper, it is shown that the capacity of children to generalize in accordance with both innate and acquired generalization classes plays a fundamental role in language acquisition. In particular, this capacity enables children to learn to associate a large number of words with the correct classes of objects and to acquire the creative ability of understanding and producing new sentences. (Author)

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THE ROLE OF INNATE AND ACQUIRED GENERALIZATION CLASSES IN LANGUAGE ACQUISITION

May 6, 1976.

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1. Introduction

Empiricist theories of language acquisition are not fashionable nowadays. Since Chomsky's (1959) criticism of Skinner (1957) and Fodor's (1965) criticism of mediation theories, many people have begun to disregard empiricist theories. This reaction, however, is unjustified. Although the criticized theories are indeed inadequate, the reason is that they are too simple. More sophisticated empiricist theories are able to account correctly for the acquisition of language.

One of the most complete of these theories is the one proposed by Quine in several of his publications (especially 1960, 1973, 1975). By combining a painstaking analysis of the linguistic skills that are learned by children with an examination of the relevant evidence, and by drawing sensible conclusions from this evidence, Quine arrived at a theory which correctly explains the acquisition of these skills.

There is, however, a difficulty with Quine's theory; it is a very complicated one. Of course, the main reason for this is that learning processes are very complex, especially those that occur in language acquisition. But there is also a second reason which I believe is not strictly necessary. What I have in mind is Quine's heavy reliance on the problematic notion of perceptual similarity. Quine uses this notion in order to explain why a response, that was reinforced in the presence of object a, is elicited by b but not by c. This is attributed to the fact

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that a is more similar (for the subject) to b than to c. But similarity is not only comparative but usually also relative. Thus, a may be more similar to b than to c with respect to shape while being more similar to c than to b with respect to color. (In order to take care of this difficulty, Quine introduces the more complex notion of a being more similar to $b_1,..,b_m$ than to $c_1,..,c_n$.)[1] Moreover, there is the additional complication that the similarity standards of a subject may change as a consequence of certain kinds of experiences. The result is that Quine's theory becomes very complex.

This complexity, however, is not a necessary feature of empiricist theories of language acquisition. In the present paper, I shall try to show that without sacrificing empiricism it is possible to give a simpler account of the phenomena which Quine explains with the help of the complex notion of perceptual similarity. This is achieved by utilizing a theoretical framework from which the notion of perceptual similarity is completely eliminated. In this framework, the main role is performed by the unproblematic notion of generalization class which reflects in a natural way the generalizing behavior revealed in many learning experiments.[2]

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[1] See Quine (1973:18).

[2] The elimination of the notion of perceptual similarity constitutes an important departure from Stemmer (1973a). Although the notion of generalization class was already used there, the treatment was essentially based on the notion of perceptual similarity. (The term used in Stemmer 1973a is actually subjective rather than perceptual similarity.)

2. Innate generalization classes

The child begins to learn the language of his community by being exposed to ostensive pairing situations. In these situations, the child hears the utterance of a verbal expression, the stimulus S_1, while paying attention to a particular aspect in his environment, the stimulus S_2. For example, a child may learn to use the word dog by being exposed to an ostensive pairing situation in which he hears an utterance of the word dog (perhaps together with some other expressions) while observing a dog.

Although exposure to an ostensive pairing situation is not always sufficient for enabling the child to apply the word to the appropriate things, it is clearly a necessary condition. No young child can learn to use correctly words like red, dog, ball, or toy, if he has not been exposed to the appropriate pairing situations (see Stemmer 1973a:6ff., 1973b).[3]

Since the child must go through ostensive pairing situations when beginning to learn his language it follows, almost by definition, that he learns something in these experiences. Let us say that he learns to associate the verbal expression with a class of entities. For example, the child who hears the word dog

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[3] When I say that a child correctly uses (or applies) a word I mean by this that he is able to understand the word when it is used in connection with the appropriate objects and that, if he has already mastered the transition from comprehension to speech, he is able to produce the word in the presence of these objects when properly motivated. (The discussion in Stemmer (1973a:6f., 1973b) shows how to test the comprehension of ostensive words, i.e. of words that are normally learned in ostensive pairing situations. See also Quine 1973:15, 45ff.)

while observing a dog may learn to associate the word with a class of animals.[4]

I say that he learns to associate the expression with a class of entities. This is prompted by the fact that the child will normally generalize from the particular observed entity to other things, that is to say, to the elements of a particular class.

Children share this generalizing capacity with many other organisms. Let me quote a typical experiment performed by Baege (1933:18):

> A lighted cigarette was held near the noses of young puppies. They sniffed at it once, turned tail, and nothing would induce them to come back to the source of the smell and to sniff again..... A few days later, they reacted to the mere sight of a cigarette or even of a rolled piece of white paper by bounding away and sneezing.

The experiment shows that the puppies, after observing that a particular cigarette had an unpleasant smell, generalized from this cigarette to other things. This generalization class, as I shall say, contained other cigarettes and rolled pieces of white paper.

Since the notion of generalization class plays a central role in the present study, let me define it formally. I shall say that class C is a generalization class for organism x if and only if x generalizes from one element of C to the other elements of C (after undergoing a significant experience with one of these

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[4] In Stemmer (1973a:10ff.), I discuss the evidence which makes it possible to determine whether a child has indeed learned to associate a verbal expression with a class of entities.

elements). If C is a generalization class for organism x then I shall sometimes say that x uses class C in its generalizations.

Psychological experiments, especially those on stimulus generalization, reveal an important characteristic of generalizing behavior. Normal members of a species, which have not undergone previously experiences that may be relevant to the generalizing behavior, usually generalize in accordance with very similar generalization classes. Thus, all the puppies of Baege's experiment used approximately the same class in order to generalize from the original cigarette; all of them learned to perform the avoidance reaction when seeing other cigarettes or rolled pieces of white paper.

Classes which are used by all normal members of a species in their generalizing behavior will be called species-determined or innate generalization classes. For example, the class of similar cigarettes, or of similar triangles, is probably an innate generalization class for humans, or very close to such a class.[5] On the other hand, the class of mammals, or of toys, or of clothes, is not an innate generalization class for this species.

An innate generalization class is usually a fuzzy class, and this holds for two reasons. (1) There are normally boundary cases which elicit only a weak reaction from the organism that is generalizing, or which only sometimes elicit the reaction. (2) Within a species there are generally idiosyncratic differences. It seems, however, that the fuzziness of these classes is

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[5] For more technical purposes, it may be important to characterize more precisely the elements of a particular innate generalization class. This can be achieved with the techniques which give us the so-called generalization gradients (see, e.g. Osgood 1953). But for the purposes of the present paper an approximate characterization in terms of similarity is sufficient.

partially counterbalanced by the so-called prototypicality phenomenon. As is suggested by certain experiments (see e.g. Posner 1973, Rosch 1975), innate generalization classes tend to converge towards 'focal' elements, even if these elements were not actually observed by the organism.

Let me point out that by speaking of innate generalization classes I do not intend to claim that the classes themselves are innate. It is the disposition to generalize in accordance with these classes (after undergoing a significant experience with one of their elements) that is species-determined and therefore probably innate.[6]

The child's capacity to generalize according to the innate generalization classes of humans plays a fundamental role in language acquisition. In the first place, it enables the child to apply a word heard in an ostensive experience not only to the original entity but also to a class of entities. In the second place, since innate generalization classes are species-determined, the capacity plays a crucial role in enabling the child to learn to associate with the word a class that is very often significantly similar to the class which adults have learned to associate with the word. Thus, consider again the young child who has heard the word dog while observing a dog. From the wide literature on this topic we know that his generalization class is usually different from the 'correct' class. It often includes cats and sometimes even horses and other animals (see e.g. Clark 1973). Nevertheless, if we consider the variety of classes which the child could have used when generalizing from the original dog, then we must admit that his class is a reasonable approximation to the correct class. For example, he

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[6] The readers who mistrust the notion of innateness can replace all occurrences of innate in this paper by the term species-determined.

might have used the class of mammals, or of three-dimensional objects, or any other class of which the original dog is an element such as the class of non-ravens.

3. Restricted classes

Still, although the child's generalization class is reasonably close to the correct class, it is not usually identical with this class. Therefore, the child must undergo further experiences in order to learn the correct use of the expression. Now, if his class is too wide, then learning the correct use is a process of discrimination. Thus, suppose that at t_1 the child has learned to associate the word *dog* with the class *D* which contains besides dogs also cats and horses. Then, the following experience may enable him to come closer to the correct class. At t_2, he observes that in his community certain elements of *D* are not called *dog*,[7] and he also notices that the *D*'s which are indeed called *dog* have a discriminating feature *F* which is not possessed by the *D*'s that are not called *dog*. For example, *F* may be the particular shape of a dog's head, or his capacity for barking, etc. Undergoing such an experience may enable the child to *restrict* his use of the word *dog*. Instead of associating it with all the elements of *D*, he will now associate it only with those elements of *D* which have the discriminating feature *F*.

Notice that this process involves at least three aspects. At t_1 the child has the ostensive experience of hearing an utterance of an expression *E* while observing an entity (object,

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[7] This can take up various forms. For example, if the child already understands expressions like *this is not a ...*, then hearing an utterance of *this is not a dog* while seeing a cat may be an experience in which the child notes that an element of the class *D* is not called *dog*. The topic is investigated in greater detail in Stemmer (1973*a*:21ff.).

aspect, event, etc.) a. This may bring him to associate the expression with the innate generalization class C that corresponds to a. At t_2, the child undergoes a falsification experience, that is, he observes that some elements of C are not named by the expression E. In addition, he observes a discriminating feature F that is possessed by the positive instances but not by the negative instances. This may enable him to restrict the associated class; he will now associate E with the restricted class CF, i.e. with the subclass of C which contains those elements of C that also possess the feature F. Usually, CF will be closer to the correct class than C.

Clearly, the process by which a child learns to understand terms like poodle, which applies only to a subclass of the (correct) class 'dogs', is of the same kind. By undergoing the appropriate falsification experiences, the child learns to pay attention to additional features which delimit poodles from the innate generalization class D as well as from the class 'dogs'.

An extreme case is the learning of proper names. For example, if the child's parents use Fido to name a particular dog, the child will have to make use of a great number of discriminating features in order to distinguish between (appearances of) Fido and the other elements of D. However, we see that, with respect to the learning process, there is no difference between learning to apply the proper name Fido to (the appearances of) a particular dog and learning to apply the term poodle to a particular subclass of the class 'dogs'. Both are processes of discrimination.[8]

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[8] Cf. Russell (1927:53): "On behaviorist lines, there is no important difference between proper names and what are called 'abstract' or 'generic' names. A child learns to use the word cat which is general, just as he learns to use the word Peter, which is a proper name. But in actual fact Peter really covers a number of different occurrences, and is in a sense general."

4. Acquired generalization classes

These are the basic features of the process that enables a child to restrict his innate generalization class in those cases where this class is wider than the correct class. But if the innate generalization class is too narrow, the process of learning the correct use is much more complex. Consider a child who is learning the use of the word toy. Suppose he hears an utterance of toy while observing a ball, and let us assume that the child does not yet understand the word ball. Such an experience may enable him to apply the term toy to his innate generalization class corresponding to the ball, which is probably a class that contains certain kinds of round objects. But this class is too narrow, since the class which (in English) is associated with the word toy includes other objects as well. Even if we suppose that the child also hears an utterance of the word while observing some other toy, say, a little train,this will not be sufficient, if his generalization class is again the innate generalization class for humans with respect to the train. The union of the two classes -- balls and trains -- will still be too narrow.

Now, we know that very often such experiences indeed enable the child to apply the term toy to a wider class, e.g. to a class that also contains little blocks (provided the child 'knows' that one can play with such blocks). But this means that the child generalizes according to a class that is not an innate generalization class of his species. Such classes will be called species-independent or acquired generalization classes.

This raises the following question: What kind of experiences enable a child to acquire a species-independent generalization class? It is likely that various types of experiences may allow an organism to acquire such a generalization class, especially if the organism is a person who understands some language. But at the most elementary level, the following experience seems

to be the most important; the organism is exposed to a series of different pairing situations in which the first stimuli (the $\underline{S}_1$) are varied while the second stimuli (the $\underline{S}_2$) are identical or significantly similar. Consider the following experiment described by Pavlov (1927:55f.). A dog was subjected to three kinds of pairing situations in which the sound of a buzzer, the sound of a metronome, and a tactile stimulus were paired with food. This had two consequences. The first was that the three stimuli acquired the capacity of eliciting typical food-reactions such as salivation. The second was that the class containing the three kinds of stimuli became a species-independent generalization class for the dog. This was shown in the second part of the experiment in which the food-reactions were inhibited with respect to the sound of the metronome. It was then observed that the inhibition generalized to the other two stimuli: the sound of the buzzer and the tactile stimulus. Hence, this dog performed a generalization which is not species-determined for dogs, since dogs do not normally generalize from the sound of a metronome to the sound of a buzzer and to a tactile stimulus. Now, this species-independent generalization is a consequence of the exposure to the three kinds of pairing situations with a constant second stimulus: the presentation of food. We can say that this experience provided the dog with the 'knowledge' that the three different kinds of stimuli share a <u>functional</u> property, say, the property of being food-signals, and we can explain the fact that the class,containing the three kinds of stimuli, became a generalization class for the dog, as a consequence of his observing that these stimuli share the functional property of being food-signals.[9]

That an organism can acquire a generalization class by being exposed to different pairing situations in which the first stimuli are varied while the second stimuli are held constant is

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[9] Quine makes a similar use of Pavlov's experiment; he illustrates with it changes in innate similarity standards (1973:20).

also confirmed by some of the experiments on semantic generalization (see e.g. Razran 1939). Consider, for example, the experiment which shows that people, who have learned English, generalize from the term vase to the term urn. The class containing the sounds vase and urn is not an innate generalization class for humans. But it has become an acquired generalization class for those children and adults who have undergone the experiences that enabled them to learn English. Now, in the case of young children we know what these experiences were; they were exposure to ostensive pairing situations in which the first stimuli were varied and the second were identical or significantly similar. Thus, they heard an utterance of vase while observing something similar to an urn and they also heard urn while observing something similar to an urn. Undergoing such an experience enabled them to acquire the class which contains the sounds of vase and urn as a species-independent generalization class. We may say that after observing that the sounds vase and urn have a similar function -- the function of naming the same kind of objects -- they learned to generalize between these sounds.

Let us now return to the child who must learn to generalize between different toys, say, between balls, trains, and blocks, in order to learn the correct use of the word toy. Our analysis shows that he may acquire this capacity by observing that these objects share a common function, say, of being objects with which one can play. More exactly, the child is exposed to pairing situations in which the perception of a ball is paired with a playing activity, the same for the perception of a train and a block. These experiences enable him to acquire the class containing balls, trains, and blocks as a generalization class.

Once this class has become a generalization class for the child, he can learn to apply the word toy to the elements of the class by undergoing a number of ostensive experiences. For example, he may hear toy while observing a ball, and again while

observing a train. However, and this is the important fact, he does not have to hear it paired with a block. Since the class is already a generalization class for the child, the two experiences may be sufficient. In this way, then, the child can learn to associate toy with a class that is wider than his innate generalization class, and in many cases this class will be closer to the correct class than the innate generalization class.

In general, in order to learn the use of terms which denote classes that are wider than innate generalization classes such as clothes, furniture, animal, young children must undergo a minimal number of these kinds of experiences. It is very likely that this even holds for terms like table or knife which also have a functional component.

In many cases, the child's innate generalization class will be both too wide and too narrow. If this happens, then the child can come closer to the correct class by undergoing a combination of the falsification experiences discussed in the previous section and the experiences just discussed here. But it is also possible that the child's generalization class is completely different from the correct class. This will occur especially in those cases where, during the ostensive pairing situations, the child did not pay attention to the 'right' aspect of the stimulus situation. Suppose the parent intended to name a chair, but for the child the salient stimulus was the ball near the chair.[10] If the child's mistake is of this kind, then undergoing further ostensive experiences with the same word will eventually enable the child to pay attention to the right aspect. This will be accelerated if he also has a number of appropriate falsification experiences.

The learning processes we have studied so far are the most basic ones. They enable the child to associate a single term with

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[10] In sec. 6, I shall discuss some aspects regarding the notion of salience.

a particular class of entities by hearing an utterance of the term while observ ng an element of the class. I shall call them isolated ostensive processes.

Of course, the present account is not a complete treatise of these processes. It does not deal with all the relevant factors.[11] I have concentrated here on exposure to ostensive pairing situations and on some special aspects that occur in connection with it. But although many of the other factors are important for the acquisition of language, the factor I have studied is crucial for this. No young child acquires the ability of correctly applying words like red, ball, toy, animal, bitter, or song, if he has not been exposed at least once to the appropriate pairing situations. Just consider the fact that most English speaking persons do not know which is the class that is associated in Spanish with the word ardilla. All their knowledge of zoology -- for ardilla denotes a class of animals -- is of no help. However, if someone utters in the presence of such a person the word ardilla while showing him the appropriate animal, then this experience may give him the knowledge of the semantic rule of Spanish which says that ardilla refers to squirrels.

Let me now define a few notions that will make it easier to deal with our next topic. If a child has learned to associate a term with a class of entities, then I shall say that he has learned to associate the term with a meaning. If the class is significantly similar to the class which adults associate with the term, then I shall say that he has learned to associate the term with the meaning, or that he has learned to understand the term.

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[11] Some of these factors have been studied in Stemmer (1973a:20ff.).

5. Contextual ostensive processes

I have assumed implicitly that in isolated ostensive processes the verbal expression, i.e. the stimulus S_1, is a single term or that, if other expressions are uttered, the child does not yet understand these other terms. Therefore, I speak of isolated ostensive processes. But now let us consider a learning process in which normally the child must hear other words and, moreover, he must already be able to understand these words.

Consider the expression to hold. It is unlikely that a child can learn to associate this term with the correct aspect just by hearing an utterance of the term while observing a holding-aspect. The reason is that a holding aspect is not normally very salient. It is therefore unlikely that the child will pay attention to just this aspect during the ostensive experience. This suggests that the child will usually learn to understand such a term by hearing it within a verbal context which he already understands.

For example, a possible situation is the following. Suppose a child is looking for his ball, and his mother says to him: (1) Daddy holds the ball. If the child already associates the expressions Daddy and the ball with the correct entities, then these expressions may direct his attention to the holding-aspect, namely to that part of the stimulus-situation which contains his father holding the ball. If this happens, the experience is an ostensive experience. The utterance of (1) is S_1 and the father holding the ball is S_2. Hence, having this experience may enable the child to learn to associate (1) with this kind of situations.

Yet, we know that such experiences enable the child to associate not only sentence (1) with the appropriate situations, but also related sentences such as (2) Mommy holds the book, provided, of course, the child already understands the expressions

Mommy and the book. But how can the child make this generalization? Clearly, (1) and (2) do not belong to an innate generalization class for humans.

Now, our discussion of the acquisition of species-independent generalization classes makes it possible to account for the child's generalization from (1) to sentences like (2). We can explain it by attributing it to the fact that, when the child learned to understand the terms Daddy, Mommy, the ball, and the book, he learned that the pairs ⟨Daddy, the ball⟩ and ⟨Mommy, the book⟩ share a common function. The function is the following: the first term of each pair has the function (in English) of naming an object that can hold the entity named by the last term of each pair.[12] On the basis of this function the child can form the acquired generalization class which includes (1), (2) and other related sentences. Therefore, the generalization from (1) to sentences like (2) is an instance of semantic generalization, although of a more complex nature than the one from vase to urn.

In general, the child will be able to generalize from (1) to all sentences of the form X holds Y provided the child has learned to associate the expressions X and Y with the corresponding objects and that he knows that these objects can stand in the specified holding-relation. Notice that this accounts for the oddity of sentences like The newspaper holds the house, because normally the objects denoted by the terms the newspaper and the house cannot stand in the particular holding-relation.

Admittedly, the function that gives origin to the acquired generalization class is a very complex one, and apparently only humans have the capacity to acquire generalization

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[12] Of course, it is not necessary that the knowledge that his parents can hold the described objects is acquired by the child during the ostensive experiences in which he learns to understand the terms. He may learn this before or after having these experiences.

classes that are based on such complex functions. Still, it is an objective function. It can be perceived by the child while observing his environment, provided the environment includes the appropriate pairing situations.

By being objective, the function is of the same nature as functions like to be a piece of furniture, to be a toy, or to name a vase (in some language). These functions can also be perceived by a child who goes through the appropriate experiences and they, too, can give origin to acquired generalization classes.

Notice that once the child becomes able to generalize from (1) to sentences like (2) he has acquired a creative ability. He is able to understand and produce sentences he has never heard before.

Some scholars argue that this creativity suggests that empiricist theories of language acquisition cannot be adequate (see e.g. Chomsky 1965:57f.). Their conclusion is mainly derived from the fact that the child's linguistic generalizations are usually not based on some kind of physical similarity, viz. the generalization from (1) to (2). Since they presume that empiricist accept only generalizations which conform to such similarities, they conclude that empiricist theories are inadequate.

But this conclusion is unwarranted. Empiricists acknowledge, of course, the psychological results that show that organisms can learn to generalize according to acquired generalization classes. Yet, many of these generalizations are not based on physical similarity. For instance, there is no significant physical similarity between the sound of a buzzer, the sound of a metronome, and a tactile stimulus, or between sounds of vase and urn. Hence, the fact that the creative linguistic capacity which is acquired by the child is not based on physical similarity does not invalidate empiricist theories of language acquisition. Of course, the child can acquire the capacity to generalize according to species-independent generalization classes only if he goes through certain

kinds of experiences. But this presents no problems, for the child who becomes able to perform the creative generalizations indeed goes through these experiences.

6. Some further extensions

The child who has learned to associate sentences of the form X holds Y with the appropriate situations has learned a semantic rule of English. Clearly, it is a very simple rule. Yet, according to empiricist views, the process by which the child learns more complex semantic rules is essentially the same. The main difference is that the aspects of the environment which he learns to associate with expressions, and the functions that determine his acquired generalization classes are more subtle. Especially, once the child learns semantic rules by hearing new expressions and new forms in a verbal context rather than in ostensive pairing situations, the increase in subtlety is very great.[13] However, so long as there is no reason for assuming an essential difference between the learning processes of simple and complex semantic rules, the empiricist position which maintains that the difference is only a gradual one agrees with widely accepted methodological views.

Besides semantic rules the child also learns syntactic rules. I shall say only a few words about the learning processes of these rules, since I have studied them in Stemmer (1973a:69ff.). Basically, the child learns syntactic rules by observing that the speech to which he is exposed shows a specific uniformity: the uniformity described by grammarians in terms of syntactic categories such as 'nouns' or 'verb phrases'

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[13] In Stemmer (1973a:87ff.) I discuss a number of basic aspects of the processes by which children learn to understand non-ostensive terms like democracy or abstract. I argue there that these processes correspond closely to second-order conditioning.

and in terms of formation and transformation rules that operate on these categories (see, e.g. Chomsky 1965). However, the child can perceive the uniformity only if the syntactic categories are psychologically significant to him, i.e. if he is able to classify linguistic expressions in these categories. Now, our conclusions regarding the acquisition of generalization classes account for this ability. Since syntactic categories are determined by the linguistic functions of their elements, they become acquired generalization classes for the child who observes that the expressions -- i.e. the elements of the syntactic categories -- have these functions (in his language). Although these functions are again very subtle, they are observable for the child, provided he undergoes the necessary experiences.

Let me now briefly discuss some aspects related to the salience of features or stimuli.[14] Consider the class that was used by Baege's puppies in order to generalize from the lighted cigarette to other objects. The class contained other cigarettes and rolled pieces of white paper. This suggest the question: Why just these objects? The intuitive answer is that these objects possessed those features of the original cigarette which normally are salient for dogs, such as its size, color, and shape. This gives us now the oportunity for clarifying the notion of innate salience. First I define: a feature F <u>significantly determines</u> a generalization class if and only if its absence significantly modifies the generalizing behavior. (Thus, if further experiments had shown that rolled pieces of blue paper did not elicit the avoidance reaction from Baege's puppies, it would have suggested that the feature 'whiteness' significantly determined the puppies' generalization class.) We can now formulate a sufficient condition for innate salience: feature F is <u>innately salient</u> for species S if F significantly determines the innate generalization classes of the species.

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[14] See also Quine's illuminating discussion of this topic (1973:25ff.).

(I give only a sufficient condition because there may exist innately salient stimuli that do not satisfy this condition.)

It is not difficult to extend this result to features that become salient for an organism. For example, an organism which undergoes the falsification experiences described in sec. 3 may be spurred to pay attention to highly subtle aspects of the environment. These aspects may then become salient for the organism, in the sense that they will now significantly determine its generalization classes.

7. Conclusions

Empiricist theories correctly account for language acquisition provided they consider all relevant factors and draw appropriate conclusions from the relevant evidence. In particular, Quine's theory explains in a very elegant and convincing manner the most important aspects of language acquisition. But there are some basic problems with Quine's theory which seem to derive from his use of the problematic notion of perceptual similarity.

In the present paper, an alternative theoretical framework has been advanced in order to account for the phenomena that are explained by Quine with the help of the notion of perceptual similarity. In this framework, a central role is played by the notion of generalization class which makes it possible to express the essential features of generalizing behavior in a natural way. Two kinds of generalization classes were distinguished, innate and acquired, and empirical evidence was discussed which shows the psychological reality of these classes. Then, a basic type of experiences was examined which children undergo when learning their language: exposure to ostensive pairing situations. Since children are born with the capacity to generalize according to the innate generalization classes of humans, and to learn to generalize according to acquired generalization classes, these ostensive experiences frequently enable

the child to associate verbal expressions with classes that are very close to those associated with the expressions by adults. Moreover, by generalizing according to acquired generalization classes, the child also acquires the creative ability of understanding and producing new sentences. Finally, I have briefly indicated that this generalizing capacity also explains the child's learning of syntactic rules.

In this way, then, we have been able to account in a relatively simple manner for the phenomena which Quine explains with the help of the complex notion of perceptual similarity. An important part of this success should be attributed to the introduction of the unproblematic and clearly defined notion of generalization class. By using this notion it has been possible to avoid Quine's complex notion without sacrificing empiricism.

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